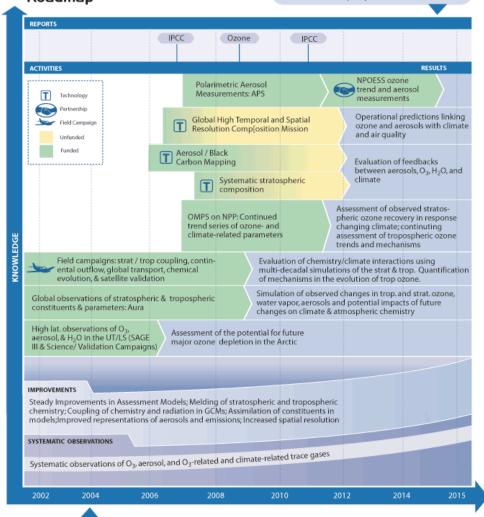
Atmospheric Composition Roadmap

WHERE WE PLAN TO BE: Improved prognostic ability for the recovery of stratospheric ozone and the impacts surface UV,

stratospheric ozone and the impacts surface UV, evolution of greenhouse gases, climate impacts, tropospheric ozone and aerosols, and the impacts on climate and air quality

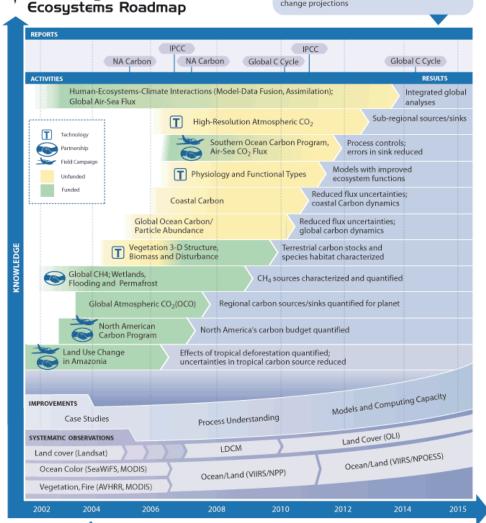


WHERE WE ARE NOW:

Halogen chemistry shown responsible for stratospheric O₃ losses; Tropospheric O₃ not well understood, but long-range transport and global change seem; Uncertainties in feedbacks between strat. O₃ recovery, trop. O₃ trends, & climate; Poor knowledge and modeling of the chemical evolution of aerosols

WHERE WE PLAN TO BE:

Global productivity and land cover change at fine resolution; biomass and carbon fluxes quantified; useful ecological forecasts and improved climate change projections



WHERE WE ARE NOW

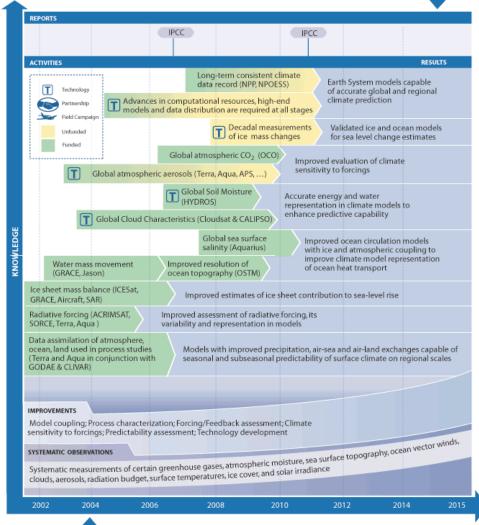
2002: Global productivity and land cover resolution coarse; Large uncertainties in biomass, fluxes, disturbance, and coastal events

-Carbon Cycle and

← Climate Variability and Change Roadmap

WHERE WE PLAN TO BE:

Characterization and reduction of uncertainty in long-term climate prediction; Enable routine probabilistic forecasts of precipitation, surface temperature, and soil moisture; Sea-level rise prediction



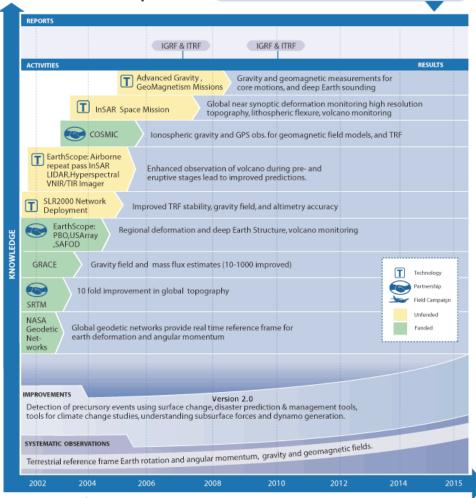
WHERE WE ARE NOW:

Experimental 12-month forecasts of surface temperature, precipitation; Fair knowledge of global climate variables and their trends; Climate models that simulate long-term global temperature change with large uncertainty in forcings and sensitivity.

WHERE WE PLAN TO BE:

← Earth Surface and Interior RoadMap

Understand plate boundary deformation & earth-quake hazards; How tectonics & climate interact ions shape the Earth's surface; Sea level changes from the interactions of ice masses, oceans, & the solid Earth



WHERE WE ARE NOW:

Space geodesy determines mm scale topography changes; Detection of Periodic and aseismic cm-scale strain events, and some seismic precursors. Postseismic stress changes linked to certain earthquakes; Volcanic inflation detected by InSAR reflect movement of magma at depth without seismic or eruptive signals.

Capability to observe, model, and predict the Water ♦ Water and Energy and Energy cycles, including regional scales and Cycle Roadmap extreme events IPCC IPCC ACTIVITIES Improved water cycle forecasts of precip-River discharge monitored globally; Snow water equivalent observations Technology itation, runoff, snowmelt, and evaporation for use in Global precipitation measurements (GPM) Decision Support Systems Global Soil Moisture (HYDROS) Quantify and elucidate mechanisms of the mean state, variability, and extremes of Global estimates of ocean evaporation and land evaporation the water and energy cycles, including quantification of Global monitoring of water and energy (GOES-R) both fluxes and storages Vertical profiles of cloud structure and Cloud parameterization and precipitation/ properties (Cloudsat/Calypso) water-vapor assimilation enabling more reliable short-term precipitation forecasts and Data assimilation of precipitation and water vapor accurate role of clouds in climate predictions Detection of gravity perturbations due to water distribution (GRACE) Assessments of natural variability in atmospheric, surface and subsurface moisture and energy EOS/in-situ observations of land surface state variables Observations of tropical rainfall/energy release Improved latent heating profiles and convective parameterizations within weather and climate models

WHERE WE PLAN TO BE:

WHERE WE ARE NOW:

IMPROVEMENTS

SYSTEMATIC OBSERVATIONS

Reservoirs and tropical rainfall well quantified Difficulty balancing the water budget on any scale Inability to observe and predict precipitation globally

Ongoing model, data assimilation and observational data improvements.

Systematic measurements of precipitation, SST, land and snow cover

2006

Enhancements in computing resources and data systems

2014

Weather and severe storm forecasting (especially hurricane landfall tracking accuracy) will be greatly improved. ♦ Weather Roadmap IPCC IPCC ACTIVITIES RESULTS Big forecast Global tropospheric winds improvement Technology GEO: Lightning, microwave sounding Improved short-term forecasts Soil Moisture (HYDROS) Improved weather, flood forecasts Improved physical & dynamical processes Global Precipitation (GPM) Global monitoring of water, energy, clouds, and Significant forecast improvements air quality-Operational prototype mission High-resolution global measurements of temperature, moisture, cloud properties, and aerosols (EOS instruments) Better description of atmospheric dynamics, cloud distributions for radiation modeling, aerosol concentrations for air quality projection, and better imagery of snow/ice cover and severe weather phenomena like hurricanes and floods. KNOWLEDGE Realistic and accelerated use by NOAA of new NASA knowledge, NASA/NOAA collaborative centers measurements, and data assimilation techniques. Observations of tropical rainfall/energy release Satellite-derived localized heating inputs leading to better physical understanding and modeling of precipitating systems. IMPROVEMENTS Steady, evolutionary improvement in weather prediction accuracy due to ongoing model refinement in operational agencies, finer-scale model resolution, improved use of probabilistic and statistical forecasting aided by multiple-component ensemble initializations, and incorporation of radar and aircraft-measurements SYSTEMATIC OBSERVATIONS Systematic measurements of atmosphere, ocean, and land surface parameters 2008 2014

WHERE WE PLAN TO BE:

WHERE WE ARE NOW:

Weather satellite sensor and technique development; used by NOAA

Version 2.0